

미국 신뢰성 교육현황과 전망 Reliability Education and Training in USA

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Abstract

We consider reliability education and training in USA including education/research institute, text, seminar/course, symposium, publications, organizations, standards, website, multimedia source, and so on.

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1. 신뢰성 교육/연구기관

- (1) Us Air Force Institute of Technology
Dayton, Ohio 45433 USA
- (2) Us Naval Post-Graduate School
Monterey, California USA
- (3) Red River
 - ▶ A joint effort between:
 - US Army Development & Readiness Command, Intern Training Center, Red River Army Depot, Texarkana
 - Texas A&M University, College Station
- (4) US Army Management Engineering Training Activity
AMETA, Rock Island, Illinois
- (5) US Army Intern Training Program
- (6) US Navy Intern Program
 - ▶ Quality Control
 - ▶ Reliability Engineering
 - ▶ Maintainability Engineering

- ▶ Testing
- ▶ Configuration Management
- ▶ Mechanical Stress Analysis
- ▶ Electrical Stress Analysis

(7) University of Arizona

Aerospace and Mechanical Engineering Dept, Tucson, Arizona

- ▶ Reliability Engineering Courses
 - Reliability Engineering
 - Reliability & life Testing
 - Maintainability engineering
 - Probabilistic Mechanical Design by Reliability
 - Design of Experiments
 - and other
- ▶ A Professional Certificate Award program in Reliability & Quality Engineering
 - Engineering Statistics
 - Reliability Engineering
 - Reliability Testing
 - Maintainability Engineering
 - Quality Control
 - Experimental Design
 - Probabilistic Mechanical Design

(8) University of Maryland

UMd, College Park, Maryland

- ▶ Students can specialize in:
 - Assessment(root-cause failure analysis, probabilistic risk assessment, common-cause failure)
 - Testing & Operation(operator manufacturing methods)
 - Component & Structures Reliability(microelectronics & materials)
 - Electronic Packaging Reliability
 - Software Reliability
- ▶ Reliability Engineering Program offer over 15 courses related to reliability engineering, including:
 - Reliability Engineering
 - Reliability Analysis
 - Collection/Analysis of Reliability Data
 - Methods in Reliability Modeling
 - Human Reliability Analysis
 - and others

(9) Rutgers, The State University of New Jersey

Piscataway, New Jersey

(10) New Jersey Institute of Technology

NJIT, Newark, New Jersey

- ▶ NJIT offers a Master's Degree in Assurance Sciences in the Industrial Engineering Department.
 - It provides course in:
 - Engineering Reliability
 - Maintainability Engineering
 - Industrial Quality Control
 - Distribution Logistics
- ▶ NJIT also provides a Certificate Program in Systems Reliability & Safety, including:
 - Environmental Risk Assessment

- Engineering Reliability
- Maintainability Engineering
- Safety in Facility and Product Design

(11) The University of Tennessee

UT, Knoxville, Tennessee

- ▶ The Maintenance & Reliability Center (MRC) at the University of Tennessee is a new resource focusing on:
 - Education
 - Research & Development
 - Information
 - Application of Advanced Maintenance
 - Reliability Engineering

(13) General

- ▶ Today, other universities in the USA teach a few courses in reliability engineering. These universities include:
 - Virginia Polytechnic Institute & State Univ. (4 courses)
 - University of South Florida (4 courses)
 - Wayne State University(3 courses)
 - Penn State University(3 courses)
 - Arizona State University(3 courses)

2. 신뢰성 텍스트자료

- ▶ Over 400 books have been published in reliability & maintainability engineering, and more are coming out ever year.

3. 신뢰성 세미나, 단기코스

- ▶ Prominent university efforts have been:
 - University of Arizona, Tucson
 - University of Maryland, College Park
 - University of California, Los Angeles
 - George Washington University, Washington DC.

The University of Arizona offers 4 Institutes annually:

The Annual Reliability Testing Institute

The Annual Reliability Engineering and Management Institute

The Annual Applied Reliability Engineering and Product Assurance Institute for Engineers and Managers

Statistical Analysis of All Types of Data and Its Software (SAT SOFT)

- ▶ ASQ now sponsors professional & technical development courses on a wide range of quality topics, including:
 - Reliability Engineering
 - System Safety and Reliability Analysis
 - Failure Modes and Effects Analysis
 - Software Quality Engineering
- ▶ RAC currently has the following courses in both private (on-site) and open registration modes(courses can be tailored to suit individual user needs):
 - Design Reliability

- Mechanical Reliability
- Advanced Design Reliability(Robust Circuit Design)
- Total Quality Management/Statistical Process Control
- Accelerated Testing
- System Software Reliability

4. 신뢰성 심포지움

- ▶ The first 'National Symposium on Quality Control and Reliability in Electronics'(1954), cosponsored by the:
 - Professional Group on Quality Control, IRE
 - Electronics Technical Committee, ASQC
- ▶ The first 'Reliability and Maintainability Conference(1962)
It merged with the Annual Symposium on Reliability(1971)
→ Annual Reliability and Maintainability Symposium
- ▶ A partial list of other current symposia is:
 - The Annual ISSAT Conference on Reliability and Quality in Design
 - The IEEE International Integrated Reliability Workshop(IRWS)
 - The IEEE International Reliability Physics Symposium
 - The International Symposium on Software Reliability Engineering, sponsored by IEEE Computer and Reliability Societies
 - The Annual Spring Reliability Symposium, Boston IEEE Reliability Chapter
 - The PSAM-IV International Conference on Probabilistic Safety Assessment and Management, New York City
 - The Annual Reliability, Maintainability, Supportability & Logistics Conference & Workshop (RMSL), sponsored by SAE G-11 Division
 - The Maintenance and Reliability Conference, sponsored by The Maintenance and Reliability Center, The University of Tennessee
 - The Machinery Reliability Conference and Exposition, sponsored by the RELIABILITY magazine.

5. 신뢰성 출판물

- ▶ Conference Proceedings/Transactions
 - Proceedings and Tutorial-Notes of the Annual Reliability and Maintainability Symposium
 - Proceedings of the International Reliability Physics Symposium
 - Proceedings of the Annual Technical Meeting of the IEST
 - Reliability and Life Testing
- ▶ 13 Prominent Periodicals
 - IEEE Transactions on Reliability, IEEE
 - Reliability Engineering & System Safety
 - Quality and Reliability Engineering International
 - Microelectronics and Reliability
 - Technometrics
 - Quality Progress
 - Journal of Quality Technology, ASQ
 - Communications in Statistics: Theory and Methods
 - Journal of the American Statistical Association
 - Operations Research
 - Journal of Structural Engineering

- Journal of Engineering Mechanics
- International Journal of COMADEM
- ▶ Trade Magazines
 - Reliability magazine
 - Quality
 - Evaluation Engineering
 - Test Engineering and Management
 - Machine Design
 - Electronics Week
 - Environmental Quarterly
- ▶ Newsletters
 - IEEE Reliability Society Newsletter, IEEE
 - RAC Journal
 - The GIDEP Newsletter
 - Reliability Assessment
 - SRE Newsletter Lambda Notes
 - System Safety Society Chapter Newsletter

6. 신뢰성 관련 기구

IEEE Reliability Society
 Society of Reliability Engineers(SRE)
 ASQ Reliability Division
 ASQ Electronics Division
 SAE Reliability, Maintainability, Supportability, and Logistics Division (G-11)
 Society for Maintenance & Reliability Professionals (SMRP)
 System Safety Society (SSS)
 World Reliability/Quality Organization (WRO)
 American Institute for Aeronautics and Astronautics (AIAA)
 Institute of Environmental Science & Technology (IEST)
 Institute of Industrial Engineers (IIE)
 Society of Logistics Engineers (SOLE)

7. 신뢰성 관련 표준

- ▶ Reliability Standards & Handbooks
 - MIL-HDBK-189, Reliability Growth Management
 - MIL-HDBK-217F, Reliability Prediction of Electronic Equipment
 - MIL-HDBK-251, Reliability/Design Thermal Applications
 - MIL-HDBK-338, Electronic Reliability Design Handbook
 - MIL-HDBK-344, Environmental Stress Screening of Electronic Equipment
 - MIL-STD-690C, Failure Rate Sampling Plans and Procedures
 - MIL-HDBK-781, Reliability Test Methods, Plans and Environments for Engineering Development, Qualification and Production
 - MIL-STD-790F, Reliability Assurance Program for Electronic Parts Specifications
 - MIL-STD-810, Environmental Test Methods and Engineering Guidelines
 - MIL-STD-883, Test Method and Procedures for Microelectronics
 - MIL-HDBK-2155, Failure Reporting, Analysis and Corrective Action System (FRACAS)

- MIL-HDBK-2164, Environmental Stress Screening Process for Electronic Equipment
- ▶ Maintainability Standards & Handbooks
 - MIL-HDBK-470A, Designing and Developing Maintainable Products and Systems
 - MIL-HDBK-472, Maintainability Prediction
 - MIL-HDBK-791, Maintainability Design Techniques
 - MIL-HDBK-2084, Maintainability of Avionics & Electronic Systems and Equipment
 - MIL-HDBK-2165, Testability Program for Electronic Systems and Equipment
- ▶ Other Standards on Quality Assurance and Reliability Engineering
 - ISO 9000 series
 - ISO 14000 series
 - IEC Publications issued by TC 56
 - IEC 60300, Dependability Management
 - IEC 60605, Equipment Reliability Testing,
 - IEC 60706, Guide on Maintainability of Equipment
 - IEC 60812, Analysis Techniques for System Reliability
 - IEC 61163, Reliability Stress Screening

8. 신뢰성 관련 사이트

- ▶ The National Information Center for Reliability Engineering
<http://www.enre.umd.edu/mainnojs.html>
- ▶ FAA Center for AViation System Reliability
<http://www.cnde.iastate.edu/faa.html>
- ▶ The Reliability Engineering Program at The University of Arizona homepage
<http://www.u.arizona.edu/~dimitri>
- ▶ Harris Semiconductor Reliability Engineering Web site
<http://rel.semi.harris.com>
- ▶ Reliability Analysis Center (RAC) Web site
<http://rac.iitri.org>
- ▶ Reliability Sciences
http://www.cs.colorado.edu/homes/mcbryan/public_html
- ▶ Software Assurance Technology Center (SATC)
<http://satc.gsfc.nasa.gov/homepage.html>
- ▶ IEEE Reliability Society homepage
<http://ewh.ieee.org/soc/rs>
- ▶ Society of Reliability Engineers (SRE) homepage
<http://www.sre.org>
- ▶ Institute of Environmental Science & Technology(IEST) homepage
<http://www.iest.org/>
- ▶ Society for maintenance & Reliability Professionals(SMRP) homepage
<http://www.smrp.org/>
- ▶ World Reliability/Quality Organization (WRO) homepage
<http://www.world5000.com/wro>
- ▶ NASA : Its focus on safety, reliability, and quality assurance (SR&QA) resources
<http://www-osma.lerc.nasa.gov/w3rel.htm>

- ▶ Commercial Reliability Web site
<http://www.barringer1.com/links.htm>
- ▶ John Wiley InterScience
<http://www.interscience.wiley.com>
- ▶ IEEE publication site
(This site is known OPERA; Online Periodicals Research Area)
<http://www.opera.ieee.org/>
- ▶ National Information Center for Reliability Engineering
<http://www.enre.umd.edu/mainnojs.html>

9. 신뢰성 영상자료

- ▶ The University of Arizona and the University of Maryland transmit reliability engineering courses directly to industry by their Instructional Television Systems.
- ▶ The University of Arizona's VIDEOCAMPUS, through its Distance Learning Division, has videotaped reliability engineering courses which include:
 - Applied Reliability Engineering in Action
 - Applied Burn-in Testing: Its Quantification and Optimization
 - Applied Environmental Stress Screening: Its Quantification, Optimization, and Management
 - Modern Engineering Design by Reliability and Mechanical Reliability Using the Stress/Strength Interference Approach
 - Applied Maintainability Engineering, Preventive Maintenance Scheduling, and Their Optimization
 - Applied Accelerated Reliability and Life Testing Concepts
 - Applied Bayesian Reliability and MTBF Testing
 - Mechanical Reliability and Probabilistic Design for Reliability
 - Reliability and Maintainability Engineering in Action
 - Reliability and Quality Analysis
 - Applied Reliability and MTBF Growth Testing Techniques and New Product Marketing Strategies
 - The Weibull Distribution and Its Reliability and Maintainability Engineering Applications
 - Reliability Engineering
 - Reliability Testing
- ▶ The IEEE Educational Activities Board and the IEEE Reliability Society co-produce tutorial videos on reliability engineering. The following videos are available:
 - Design Systems for Reliable Human Performance
 - Concurrent Engineering Perspectives: Concept to Success
 - Developing Reliable Software in the Shortest Cycle Time
- ▶ Other sources include but are not limited to:
 - AMCEE, Association for Media-Based Continuing Education for Engineers; 225 N. Avenue, NW; Atlanta, Georgia 30332 USA
 - Engineering Renewal and Growth; Engineering Research Center; Colorado State University; Fort Collins, Colorado 80523 USA
 - Juran Institute Inc; POBox 811 (11 River Rd); Wilton, Connecticut 06897-0811 USA
 - ASQ Quality Press; 611 E. Wisconsin Ave; Milwaukee, Wisconsin 5321-3005 USA

10. 신뢰성관련 학위 논문

11. 신뢰성 전문인력 자격제도(CRE)

12. 제안

- ▶ For industries to survive in the intense worldwide competition, they must learn how to conceive, design, manufacture, test, package, and deliver to the user, products that:
 - perform their unique designed-for function reliably
 - are easy to maintain or need no maintenance for their designed life,
 - are of high, impeccable quality
 - sold at globally competitive prices
- ▶ Strongly recommend that Colleges of Engineering require that all engineers have at least one course in:
 - Engineering probability & statistics
 - reliability engineering